WHAT IS CLAIMED IS:

1. A method for cleaning a semiconductor wafer having a copper layer exposed to a surface thereof after a chemical mechanical polishing, comprising the steps of:

a) treating said semiconductor wafer with a first washer selected from the group consisting of aqueous ammonia containing ammonia at 0.0001 - 0.5 weight percent, a catholyte between neutral and weak base and hydrogen containing water for removing polishing particles from said semiconductor wafer without damage to said copper layer; and

b) treating said semiconductor wafer with a second washer containing at least one decontaminating agent selected from the group consisting of polycarboxylic acids each capable of producing a chelate compound together with copper, ammonium salts of said polycarboxylic acids and polyaminocarboxylic acids for removing metallic contaminants from said semiconductor wafer.

2. The method as set forth in claim 1, in which a polishing slurry is used during said chemical mechanical polishing, and contains said polishing particles and at least one oxidizing agent serving as a contamination source for at least one of said metallic contaminants.

3. The method as set forth in claim 2, in which said polishing particles are brushed away from said semiconductor wafer, and said first washer allows said polishing particles and said surface to be negatively charged.

4. The method as set forth in claim 1, in which said catholyte is produced through an electrolysis in one of pure water and aqueous ammonia containing ammonia equal to or less than 0.5 weight percent.

5. The method as set forth in claim 4, in which said catholyte contains said ammonia at 0.0005 - 0.01 weight percent.

6. The method as set forth in claim 1, in which said hydrogen-containing water is produced through a hydrogen bubbling in one of pure water and aqueous ammonia containing ammonia equal to or less than 0.5 weight percent.

7. The method as set forth in claim 6, in which said hydrogen-containing water contains hydrogen at 0.1 - 10 ppm.

8. The method as set forth in claim 7, in which said hydrogen-containing water further contains said ammonia at 0.0005 - 0.01 weight percent.

9. The method as set forth in claim 1, in which said polycarboxylic acids are oxalic acid, citric acid, D-tartaric acid, L-tartaric acid, malonic acid, malic acid, malein acid and succinic acid.

10. The method as set forth in claim 9, in which said ammonium salts are salts of said oxalic acid, said citric acid, said D-tartaric acid, said L-tartaric acid, said malinic acid, said malic acid, said malein acid and said succinic acid.

11. The method as set forth in claim 1, in which said catholyte and said hydrogen-containing water has an oxidation-reduction potential between -1000

milli-volt and -800 milli-volt when a reference electrode is formed of silver chloride.

12. The method as set forth in claim 3, in which said surface is formed of an insulating material selected from the group consisting of silicon oxide, benzo-cyclobutene, parrylene-N, cytop, xerogel, hydrogen silisesquiioxane and methylsilane based composite material containing hydrogen peroxide.

13. The method as set forth in claim 1, in which said second washer is supplied to a major surface of said semiconductor wafer where said copper layer is exposed, and a third washer containing hydrofluoric acid and hydrogen peroxide is supplied to a reverse surface of said semiconductor wafer.

14. The method as set forth in claim 13, in which said hydrofluoric acid, said hydrogen peroxide and water are regulated to 1 - 10 : 1 - 10 : 200.

15. The method as set forth in claim 1, in which a centrifugal spray cleaning technique is used in said step b).

16. A method for cleaning a semiconductor wafer having a tungsten layer exposed to a surface thereof after a chemical mechanical polishing, comprising the steps of:

a) treating said semiconductor wafer with a first washer selected from the group consisting of aqueous ammonia containing ammonia at 0.0001 - 5 weight percent, a catholyte between neutral and weak base and hydrogen containing water for removing polishing particles from said semiconductor wafer without damage to said tungsten layer; and

b) treating said semiconductor wafer with a second washer containing at least one decontaminating agent selected from the group consisting of oxalic acid, ammonium oxalate and polyaminocarboxylic acids and ranging from 0.01 weight percent to 7 weight percent for removing metallic contaminants from said semiconductor wafer.

17. The method as set forth in claim 16, in which a polishing slurry is used during said chemical mechanical polishing, and contains said polishing particles and at least one oxidizing agent serving as a contamination source for at least one of said metallic contaminants.

18. The method as set forth in claim 17, in which said polishing particles are brushed away from said semiconductor wafer, and said first washer allows said polishing particles and said surface to be negatively charged.

19. The method as set forth in claim 16, in which said catholyte is produced through an electrolysis in one of pure water and aqueous ammonia containing ammonia equal to or less than 5 weight percent.

20. The method as set forth in claim 16, in which said hydrogen-containing water is produced through a hydrogen bubbling in one of pure water and aqueous ammonia containing ammonia equal to or less than 5 weight percent.

21. The method as set forth in claim 18, in which said surface is formed of an insulating material selected from the group consisting of silicon oxide, benzocyclobutene, parrylene-N, cytop, xerogel, hydrogen silisesquiioxane and methylsilane based composite material containing hydrogen peroxide.

22. The method as set forth in claim 16, in which said second washer is supplied to a major surface of said semiconductor wafer where said tungsten layer is exposed, and a third washer containing hydrofluoric acid and hydrogen peroxide is supplied to a reverse surface of said semiconductor wafer.

23. The method as set forth in claim 22, in which said hydrofluoric acid, said hydrogen peroxide and water are regulated to 1 - 10 : 1 - 10 : 200.

24. The method as set forth in claim 16, in which a centrifugal spray cleaning technique is used in said step b).